

# NREL Bioprocessing Pilot Plant Available for Industrial Use



*Biomass Program—Sustainable Fuels, Chemicals, Materials, and Power*

## Equipment at NREL's Bioprocessing Pilot Plant

### Fermenters

- One 20-L fermenter
- Two 160-L fermenters
- Two 1500-L fermenters
- Four 9000-L fermenters
- All fermenters are equipped for anaerobic and aerobic operation with temperature, pH, DO, and agitation control. Exhaust gas component concentrations can also be measured by mass spectrometry on the 1500- and 9000-L fermenters.
- 9000-L fermenters are equipped with level control and can operate in either batch or continuous mode.
- Numerous sterilizable support and feed vessels are available ranging in size from 100-9000 L.

### Filters

- Ultrafiltration/Reverse Osmosis Pilot-Scale Filtration System (Niro) – Continuous, processes up to 1500 L/h
- Filter Press (Pneumapress) – Semi continuous, processes up to 100 L/h, cloth filter media, high pressure dewatering

### Centrifuges

- Solid-Bowl Centrifuge (Cepa) – Continuous, processes up to 400 L at 50-250 L/h, 17,000 G
- Ultra High Performance Decanter (Bird Machine) – Continuous operation, sterilizable, processes 100's L/h, 5000 G
- Basket Centrifuge (Bock) – Batch, processes 50-400 L/h, cloth filter media, 1300 G
- Solid-Bowl Decanting Centrifuge (Sharples) – Continuous, processes up to 1200 L/h, 3000 G

### Product Purification and Analysis

- Pilot-Scale Ion Exchange/Chromatography System (Advanced Separation Technologies) – Continuous moving bed system, processes up to 250 L/h
- FPLC Systems
- HPLC Systems
- Native and SDS Page
- Isoelectric Focusing

Microbial bioprocessing can produce a myriad of valuable products. If you are an industry needing small- or large-scale trials to test or advance a bioprocessing technology, National Bioenergy Center (NBC) facilities at the National Renewable Energy Laboratory (NREL) in Golden, Colorado, may allow you to use world-class systems and expertise without the expense of building your own pilot plant.

Whether your process uses yeast, fungi, or bacteria—including genetically engineered microorganisms—we can help you prove or advance the process at any scale. Fermentations can be done at a smaller scale in our Mini-Pilot Plant or in fermenters as large as 9000 liters in our Bioprocessing Pilot Plant.

The Mini-Pilot Plant is a Biosafety Level 2 (BSL-2) facility in which cells can be grown in 5- to 150-liter vessels followed by purification of the product at intermediate scale. This facility allows affordable research development that will lead your technologies to pilot or commercial scale.

The NREL Bioprocessing Pilot Plant is a Biosafety Level 1 large-scale (BSL-1 LS) facility housed in an 8000-square-foot building on the NREL campus. Although originally designed for converting lignocellulosic biomass to ethanol, the plant includes most fermentation and downstream processing equipment commonly used in the biotechnology industry.

Part of the U.S. Department of Energy (DOE) Bioethanol Pilot Plant and NREL Alternative Fuels User Facility, the bioprocessing fermentation facilities are available for non-DOE academic or industrial collaborations under a variety of contractual arrangements including analytical or technical service agreements, work-for-others contracts, and cooperative research and development agreements. Our partnership coordinators can help craft an arrangement that will work best for you.



Dave Parsons, NREL/PIX 05208

Fermentation tanks and other equipment at the NREL Bioprocessing Pilot Plant are available to help industrial users develop numerous valuable products from sugar.



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# Bioprocessing Capabilities



Warren Gretz, NREL/PIX 05870

## Fermentations and Cell Growth



Dave Parsons, NREL/PIX 03919



Nick Nagle, NREL/PIX 11550

## Cell Mass Harvesting by Filtration or Centrifugation



Dan Schell, NREL/PIX 12628

### For more information about *Fermentation Bioprocessing Pilot Plant Capabilities*, contact:

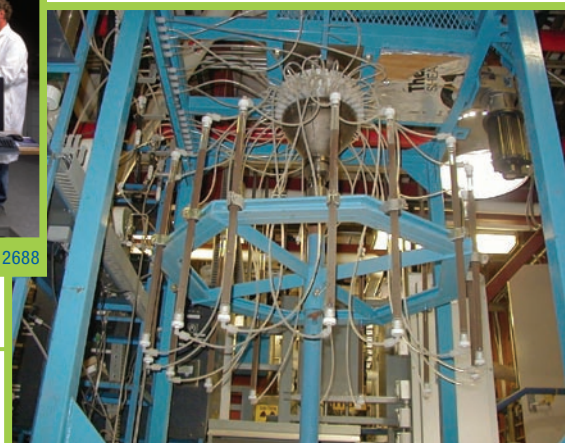
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Jim Yost Photography/PIX 12688



Dan Schell, NREL/PIX 12629

## Product Purification

### Produced for the



### U.S. Department of Energy Energy Efficiency and Renewable Energy

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1000 Independence Avenue, SW, Washington, DC 20585  
by the National Renewable Energy Laboratory, a DOE national laboratory

**A Strong Energy Portfolio for a Strong America**  
Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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